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Modern Industrial Organization Theory of Media Markets and Competition Policy Implications

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Abstract: This paper outlines the modern industrial organization theory of media markets including competition policy implications. After recapturing fundamentals of industrial organization theory in a non-technical way, the state of the art of (i) modern platform economics, (ii) the economics of the so-called sharing economy, and (iii) the economics of data-based business models and data-driven markets is summarized in a detailed way and illustrated by modern media examples.

Keywords: industrial organization, media economics, industrial economics, platform economics, sharing economy, digital economy, digitization, big data, economics of privacy, competition policy, antitrust economics

JEL-Codes: L0, L82, L10, A2, K21

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Contents

1 Introduction and Motivation

The economics of industrial organization or, in other words, industrial economics is an extension of microeconomics. They serve to explain markets and market processes as well as the strategic behavior of companies in a competitive market. The approaches of industrial economics are suitable for analyzing every market or industry regardless of whether these are classic manufacturing markets, service markets, health care markets or even media markets. Consequently, understanding media markets require command of industrial organization economics. On the one hand, understanding markets is increasingly important because it is the theoretical basis for competition policy and regulatory policy. Competition policy sets the "rules of the game", i.e. the rules governing market conduct, in general. Regulatory policy is about rules that specifically apply only to certain markets. If these policies shall promote social welfare, they must rest in sound industrial economics analysis. Industrial economic know-how is important for competition authorities and for regulators but also for companies. The reason for this is simple: companies are active in markets and they are subject to competition law and/or regulation. If a company does not have industrial economic know-how, it will lead to misjudgments and wrong management decisions. On the other hand, understanding markets obviously benefits managerial competences in a direct way. Eventually, understanding the working of media markets also helps understanding communication processes in the modern world.

The process of digitization and the increasing importance of the internet have considerably changed the nature of media markets. Accordingly, industrial economics has developed new theories and concepts to describe and analyze modern media markets. The origins of industrial organization trace back to *Adam Smith* in the eighteenth and *Alfred Marshall* in the nineteenth century. *Antoine-Augustin Cournot* and *Joseph Louis François Bertrand* significantly expanded their work by introducing mathematics as a method. Most modern IO-models still wear the genes of their landmark standard models. One of the pioneers of empirical industrial economics was *Joe Staten Bain* in the twentieth century (for an overview see *Waldman & Jensen* 2014). Modern industrial organization theory focuses on oligopoly theory, often based on game theory, institutional economics and transaction cost theory as well as behavioral economics. In addition, there are many econometric works as well as experimental economics approaches that examine markets empirically and challenge the theories.

Industrial economics is the basis of modern media economics. The knowledge of microeconomic fundamentals is therefore indispensable for understanding modern media economics. On the one hand, many of its models and concepts are used in the media sector. On the

other hand, there have been extensions to meet the needs of the media industry.[1] These enhancements include platform economics, the sharing economy, and the discussion of big data. In this contribution, essential industrial economic foundations are explained (chapter 2). Subsequently, modern theory is discussed (chapter 3) before chapter 4 sketches some regulatory implications.

2 Foundations of Industrial Organization

2.1 Basic Concepts: Costs, Efficiency, and Economies

Short-term Production Costs

Short-term costs imply that the company has chosen its capacity and uses it to a greater or lesser extent. The capacity is the given operating size of a firm or company. This includes the production facilities, the production process, the employees, the location, the warehouses, the equipment with servers, etc. The capacity cannot be changed in the short-term, only in the long-term. The costs at different utilization levels of the capacity thus describe the short-term cost functions.[2]

The associated short-term average costs are also formed microeconomically. Accordingly, there are average fixed costs, average variable costs and average total costs. The average cost categories are calculated by dividing the fixed, variable and total costs by the output quantity. The course of these costs depending on the output quantity differs according to whether a linear or a U-shaped course of the marginal costs is assumed. The average fixed costs always decrease, if the produced quantity gets bigger. In terms of media economics, this fixed cost digression is also referred to as the "first-copy-cost-effect". A simple example would be film production. We imagine, a film is shot, cut and ready to be shown. Now suppose that the total cost of this film are 100 m Euro. If only a single Blu Ray Disc is made from this film, this single Blu Ray Disc would have to bear the entire fixed costs and the average fixed costs would be 100 m Euro. If two Blu Rays are produced, the average fixed costs will drop to 50 m Euro. With three Blu Rays, the average fixed costs amount to 33.33 m Euro, etc. Another example would be an online service. This has costs in development, programming, etc. However, offering the service on the internet leads to (almost) no cost at all. If only one service is offered, it must bear all fixed costs.

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1 This does not mean that the "Old Industrial Economics" is (always) needless or wrong!

2 The capacity can be underutilized, normally busy and over-loaded (up to the capacity limit). For different short-term cost categories and further information see *Pindyck & Rubinfeld* (2010) and *Perloff* (2001).

Long-term Costs

The difference between short-term and long-term costs is that in the long term, all costs are variable. In other words: we intend to invest but have not done so yet. Assume we plan a Blu Ray press shop. So we think about how the capacity of our company should be. We can freely decide on the number of buildings, the offices and the production plant as well as the size of the warehouses and the production technology used. In our decision, we have to consider the prices of energy and consumables as well as the wage amount and the amount of interest. The idea is that we align the capacity with the planned production quantity. Only then can we produce cost-optimally. In the situation before the investment, we now compare the existing investment and production possibilities with an assumed normal capacity utilization.[3]

Economies of Scale and Scope

In some markets we can see that the long-term average cost curve is L-shaped. The larger the capacity(!), the lower the long-term average costs. There is a point or a capacity, which we call "minimum optimal scale" (X_{MOS}). Graphically, the minimum optimal scale is the point from which the long-run average cost curve runs horizontally. Economically, this means that all economies of scale have been exhausted. This means that a larger capacity than X_{MOS} does not lead to a further decrease in the average cost. Two things are already clear at this point: First, if such an L-shaped course of the long-run average total cost exist, then there are economies of scale. Companies with a large capacity have cost advantages compared to small and medium-sized enterprises. Second, economies of scale are something other than a fixed cost degression or a "first-copy-cost-effect"! Economies of scale describe the relationship between capacity and cost. Economies of scale can but do not have to be in a market. The fixed cost degression always takes place, because it is the short-term view and quite simply the fixed costs are divided by the output (*Koutsoyannis* 1980: 106-107).[4]

In addition to economies of scale, economies of scope also play a role in the media sector. Economies of scope exist when two or more separately producible goods can be produced more cheaply by one company than by two or more companies.[5] In summary, there are three reasons for economies of scope. First, the so-called public input, i.e. the production of a

[3] For an overview see *Koutsoyannis* (1980).

[4] See also *Carlton & Perloff* (2000), *Scherer & Ross* (1990), *Shy* (1995) and *Tirole* (1993).

[5] From the economies of scope the combined production is to be delimited. In combined production, the individual goods typically cannot be produced separately. In a more or less variable ratio, therefore, at least one more product is produced when producing a good. A textbook example of this is the processing of crude oil in refineries. This always incur certain proportions of gasoline, heavy and light fuel oil, etc. The ratio is only slightly influenced.

good requires production factors that can be used for very small or marginal costs of zero for a second good. An example would be market knowledge that a company has acquired for a product, such as a journal or an online platform, and which can be used at zero marginal cost for the introduction of a second journal or another online platform. Another example would be an editorial office that creates specific content. This created content is typically never completely used for a journal, so that the unused content could now be used at zero marginal cost for a second journal or recombined with other content into another journal. Second, the shared input means that the sharing of production factors leads to a lower consumption of resources than their use in two or more companies. A textbook example is a wind tunnel. If not only one car model but several are tested in the same wind tunnel, cost savings can be reaped compared to if several wind tunnels would be necessary for different models. The same applies to the publishing sector because if two magazines are written by two companies then two editorial offices would be necessary instead of one if the two magazines are developed within the same company. The third reason for economies of scope is that the combined production of two or more goods can result in economies of scale being exploited more quickly. For example, a wind tunnel can only be created and operated cost-optimally after a certain number of tests or testing of models. Even the optimal, minimum-cost size of editorial staff is only reached after a certain number of magazines and newspapers.[6]

Economies of Density

In addition to economies of scale and scope, economies of density can also occur in the media sector. Economies of density occur when average costs are lower in areas with high customer density than in areas with low customer density. Thus, economies of density play a role wherever infrastructure and networks (net industries) are needed. Examples would be internet connections, landline connections, mobile networks or postal deliveries. In all these areas, it is much cheaper to connect or reach a certain number of people in a densely populated area than in sparsely populated areas. In extreme cases, with one kilometer of fiber-optic cable in a large city with a high population density, thousands of consumers can be reached, while in rural areas only very few consumers are supplied per kilometer. When economies of density exist, they have a significant impact on business incentives and behaviors. First of all, there is an incentive to enter the market where a potentially high number of customers are reached at low cost. This means, for example, that the rural regions are con-

[6] For an overview see *Carlton & Perloff* (2000), *Scherer & Ross* (1990), *Shy* (1995) and *Tirole* (1993).

nected much later which is precisely what can be observed in fiber-optic cable network expansion in Germany. At the same time, there would be regional price differentiation. In the densely populated areas, an internet connection would be much cheaper for the customer, because the connection costs are considerably lower. In the countryside, a connection of the same quality would cost considerably more (for overviews and further details see *Belleflamme* & *Peitz* 2015; *Carlton* & *Perloff* 2000; *Scherer* & *Ross* 1990; *Shy* 1995; *Tirole* 1993).

Sunk Costs

Another important cost concept is sunk costs. Sunk costs include the part of the fixed costs that cannot be recaptured when firms leave a market or represents the difference between the acquisition value for the planned and the value in the next best use. A good example of sunk costs is advertising expenditure. If a company advertises a product and this product flops, all advertising expenses are irretrievably lost. By contrast, if a company invests in an office building and is subsequently forced out of the market, the office building can be sold and not all fixed costs are irretrievably lost. Sunk costs are the higher the more specialized an investment good is, because the value of a very special capital asset in an alternative use is very low. Furthermore, sunk costs have the property that they are unavoidable after the investment, i.e. parts of the fixed costs are irretrievably lost. Sunk costs also found market entry and market exit barriers. The logic here is that investments with high sunk costs have a high risk and therefore companies refrain from investing or are not leaving the market due to sunk costs (for overviews and further details see *Belleflamme* & *Peitz* 2015; *Carlton & Perloff* 2000; *Scherer & Ross* 1990; *Shy* 1995; *Tirole* 1993).

Transaction Costs

Since the landmark essay by *Ronald Harry Coase* "The nature of the firm" in 1937 another cost category became relevant, namely transaction costs. Transaction cost theory deals with question why there are companies at all when, principally, every worker in a market economy could be self-responsible, self-employed, and exchange the results of his production on specialized markets. However, essentially, companies coordinate individual activities and, thus, according to *Kenneth Joseph Arrow* 1969, represent "islands of hierarchical coordination" in the market system (see also *Arrow* 1991). In a simple definition, a transaction takes place when a good is transmitted via a technically separable interface. Transaction costs can therefore be defined as the costs of coordinating transactions between economic entities. Transaction cost theory analyzes the factors determining the level of transaction costs when using alternative coordination methods. Internally, companies coordinate the activities of employees hierarchically and decide on the market behavior in the external relationship, and take advantage of the opportunities and risks arising from the company's economic activities in

the markets. Employees work in the company under hierarchical management and for a (more or less) fixed, non-performance-related remuneration. From the company's point of view, it is therefore relevant to examine whether, for instance, an upstream stage of the supply-chain should be integrated into the company or whether the respective good should be purchased via the market (make-or-buy decision). In principle, this is the answer to the question whether a hierarchical or a market-based coordination should take place. Depending on whether transaction costs in the hierarchical are higher or lower than in the market coordination, one of the two forms of coordination is preferable (*Williamson* 1985).

2.2 Types of Markets and Barriers to Entry and Exit

Introduction

In economics, the term market refers to a (virtual) place where supply and demand meet. Its main characteristic is the decentralized, self-organized coordination of supply and demand via the process of competition. Price signals set incentives for individual suppliers and customers to adjust their individual production and consumption plans in a way that market supply and market demand move towards each other in terms of quantities (coordination). Without the self-organizing force of market competition, supply and demand run a high risk of permanently diverging with an increasing divide. In its model theory representation, this process of coordination ends up in equilibrium because changes of the framework and environmental conditions are ignored (in order to theoretically isolate the coordination mechanism). In reality, these framework and environmental conditions, however, change permanently, i.e. cost changes, changes of tastes and preferences, changing trade conditions, developing knowledge and technologies, etc. These changes represent a diverging force on market supply and demand, whereas market competition represents a coordinating force amid the inherent dynamics of the economy. In other words, permanently new coordination needs are created and, thus, the coordinating market process is permanent. So far, no centralized, public mechanisms have been found or developed that are able to cope with this coordination task.[7]

If a market is hypothetically reduced to its inherent coordination mechanism, i.e. it is assumed, inter alia, that (i) there are no changes of the environment and framework conditions, (ii) the number of suppliers and customers is so high that no single supplier or buyer

[7] According to *Friedrich August von Hayek* (1945, 1968), it is impossible to replace the decentralized and self-organizing competitive market process by any centralized and administrative mechanism. So far, empirical evidence has fully supported his assessment.

can influence the market price, (iii) perfect information, and (iv) a homogenous good is traded, then we call this the basic model of a homogenous polypoly or "perfect" competition. This type of market is relevant for analytical purposes; however, it hardly exists in reality.

Oligopoly Theory

Most real-world markets can adequately be described as belonging to the oligopoly types of markets. Oligopoly models tackle another important feature of competitive markets, namely the strategic interdependence among suppliers (and among customers as well). The success of any employed strategy in competition depends (i) on the smartness of your strategy, but (ii) also on the reactions of your competitors to your strategy. A price decrease may yield an increasing demand – but not so if your competitors decrease their prices even further. A smart innovation may successfully draw new demand – but not so if the innovation of your competitors is even smarter. It is like in parlor games: the quality of a move (in terms of success) depends both on the ingenuity of the move itself and on the brilliancy of the reactions of the other players. Not accidentally, the branch of mathematics analyzing such phenomena of strategic interdependency is called game theory. Consequently, companies acting on competitive markets face two restrictions to their strategic behavior: (i) (as always) the reactions of the customers and (ii) the reactions and actions of the competitors.

Thus, proper competitive processes take place in oligopolistic markets where suppliers compete via various strategies like, for instance, pricing, product and service design, product differentiation, innovation on goods and technologies, etc. Consequently, this type of markets is extremely multifaceted. Correspondingly, industrial economics has developed numerous models analyzing oligopolistic competition. For the purpose of empirical market analysis, these models may be tailormade to the specifics of a given market and calibrated by real-world data (for an overview see *Budzinski & Ruhmer* 2010.).[8]

A very important distinction relates to the difference between homogenous and heterogeneous goods. The term goods includes both products and services as well as immaterial versions of those like, for instance, digital goods or intellectual property rights. Homogenous goods are identical in the eyes of the customer, i.e. customers have no preferences from which supplier they buy the good. Next to the "objective", technical features of the good being identical, homogeneity also include the absence of more "subjective" features like brands, design, supplier reputation, etc. The latter is the reason why homogenous goods are rarely found on markets where consumers are the buyers because they usually have prefer-

[8] For instance, with the help of econometric methods or simulations.

ences for such things. On business-to-business markets, homogenous goods exist particularly for raw materials and standardized compounds. Whenever customers have preferences about suppliers, heterogeneous goods are present. Quantity (Cournot) competition can often be found in markets with few suppliers and relatively homogenous goods, whereas price (Bertrand) competition is particularly relevant for markets with heterogeneous goods. While Cournot-oligopolies tend towards low competition intensity and collusion (cartels, coordinated effects, tacit collusion, etc.), heterogeneous Bertrand-oligopolies represent the empirically most relevant environment for various competition strategies of enterprises. It thus has become the most important theoretical framework in industrial organization during the last three decades.[9]

Monopoly

If there is only one supplier present on a market, then this type of market is called monopoly. Within competitive processes, temporary monopolies may emerge if disruptive innovations create new markets with the innovator being the monopolist. However, competitors imitating the innovation will soon recreate competition in such markets. A second market-internal monopoly may follow platform and network effects, which will be addressed in section 2.3. Generally, the probability of permanent market-immanent monopolies decrease with the size of the market and, particularly, the heterogeneity and diversity of goods traded on that market. The vast majority of the monopolies existing in the real-world are protected against competition by some form of public regulation (monopoly privilege). A monopolist faces only one of the two usual restrictions to its strategic behavior: while he still needs to consider the reaction of the customers (who may stop buying the good), the competitor restriction is not apparent anymore. Persistent monopolies harm welfare because of (i) an efficient allocation (higher prices accompanying lower quantities), (ii) a considerable decrease in innovation dynamics, and (iii) an exploitation of customers (to the gain of the monopolist at the expense of social welfare).

While long-run pure monopolies are rare and usually the result of and protected by governmental intervention, quasi-monopolies represent a more frequent phenomenon. These are markets where one company is so much bigger than the others that it enjoys almost monopoly-like market power.

[9] Textbooks often additionally refer to the case of Bertrand competition with homogenous goods and without capacity constraints because in this specific case the oligopoly resembles the results of the polypoly („perfect" competition) model. However, this specific case rarely surfaces in reality and its results do not hold for the much more complex world of heterogeneous Bertrand-oligopolies.

Contestability and Barriers to Entry

The contestability of different markets varies according to the presence of barriers to entry and exit. In the present literature (originally pioneered by *Joe S. Bain*), the division into state, structural and strategic barriers to entry is predominant. State (or institutional) barriers to market entry arise through administrative market access regulations. Examples would be taxi licenses, patents, vocational training to be completed, etc. Structural barriers to entry stem from the nature of the market (for example, economies of scale, investment requirements, advantages from experience and learning, etc.). Strategic barriers are created by established companies on the basis of structural or state barriers to market entry. The established companies are therefore making strategic use of the structural and state barriers to market entry. These include strategies such as raising rivals costs, strategic overcapacity, strategic patent policies, artificial creation of incompatibilities and switching costs, excessive brand building, etc. (for overviews and further details see *Belleflamme* & *Peitz* 2015; *Carlton & Perloff* 2000; *Scherer & Ross* 1990; *Shy* 1995; *Tirole* 1993.)

Barriers to entry protect the insiders who are already in the market (incumbents) from new competition by outsiders entering the market (newcomers). This may be crucial to turn a temporary monopoly (for instance, due to disruptive innovation) into a persistent one because it prevents imitation competition. Institutional barriers to entry are often prohibitive in the sense that they cannot be overcome (already determined by law) and harm contestability more severely than structural and strategic barriers. Similarly, barriers to entry may allow a dominant company in a quasi-monopoly to preserve and protect its market power (and increase the cope for abusing it). In oligopolies, barriers to entry do not completely prevent competition but they do reduce competition intensity in the market because incumbents only compete with each other and do have to face maverick newcomers. Barriers to exit are relevant as well because leaving a market is costly (for instance, due to sunk costs), this will negatively affect the decision to enter it.

In former times, relevant entry barriers to media markets included the scarcity of frequencies, naturally limiting the number of broadcasting channels (radio and television programs), or the necessary to have access to the cable network of telecommunications or television. Thanks to digitization, mobile technology and the internet, these structural barriers to entry have virtually vanished. A relevant entry barrier regarding the provision of media contents was always seen in the selecting function of publishers and editorial offices who decided about the program contents and, thus, determined among which options consumers could choose. The ubiquitous availability of online services renders this barrier to entry ineffective as well as virtually everyone can now offer their contents easily through the internet.

However, does this imply that there are no barriers to entry in modern media markets? Two examples demonstrate that it is not that easy. First, the problem of information overflow implies that access to audience attention is crucial for the commercial success of online contents (*Falkinger* 2008; *Budzinski* & *Gaenssle* 2018). The numbers of uploaded content by far exceeds what users (consumers) can survey in order to make an informed consumption decision. Instead, they need someone to preselect the content options. On the internet, this is partly done by promotion or multichannel networks that basically take over the role of the former editorial offices in selecting what is brought to the attention of the user and what not. Interacting with these promotion networks are individualized search and recommendation algorithms of relevant platforms (like YouTube, Netflix, etc.). Empirical research confirms that most users limit their choice of contents to the items listed on the first page of their recommendation list. These algorithms usually aim to combine two goals: (i) bringing content to the user that satisfies her individual preferences (based on the users' consumption history[10]) and (ii) increase the consumption of the network so to maximize the platforms' revenues. While the exact working properties of the algorithms are business secret and changed quite frequently, smart promotion network managers excel in guessing the underlying mechanisms correctly and managing to push their contents (artists, videos, songs, movies, etc.) up on the recommendation lists, so that they receive the attention of more users (*Budzinski* & *Gaenssle* 2018). Without such professional help, it is getting increasingly more difficult to effectively "enter" online markets in the sense that your content is even perceived by a relevant number of users (structural barrier to entry).

Secondly, on modern media markets, switching costs and lock-in effects gain importance as relevant entry barriers (*Burnham* et al. 2003). For instance, the running time of an internet access contract or a mobile phone contract prevents switching to another provider during the contract period. Due to habituation effects, customers may have become accustomed to Apple products and therefore always opt for an Apple product when purchasing new (lock-in). In particular companies with market power experience incentives to artificially increase switching costs and create incompatibilities with competitors in order to lock-in their consumers. For instance, while it is common that telephone calls are interconnected irrespective of the provider, it is not possible to use Facebook's messengers and social networks (including subsidiaries like WhatsApp) to communicate with consumers using different apps and networks. Obviously, it would be no problem to allow for this from a technological point of

[10] See section 3.3 for more details on data-based business models.

view but Facebook may lock-in its users by blocking compatibility here (strategic barrier to entry).

2.3 Market Failure

Introduction

A market failure exists when a market does not come to fruition or when market competition leads to inefficient results. The term "failure" may be somewhat misleading since such markets often "just" work imperfectly but still work – and often better so than alternative regimes. If there is a market failure, government intervention can be considered. However, while regulation may improve the working of the market in these cases, there is no guarantee that it does so in reality (inefficiencies of political decision processes including lobbyism as well as bureaucratic and administrative deficiencies may well mean that the regulated market performs even worse than the "failed" market). Government intervention should, therefore, be as mild and reluctant as possible, so as to distort competition as little as possible. Note that if a market that is already under regulation and/or government intervention performs badly, then this may be regulation failure rather than market failure. There are four reasons in the literature that lead to market failure.

Natural Monopoly

Economies of scale may create a natural monopoly. A natural monopoly exists when the demand curve of a homogenous market intersects the long run average total cost curve in the falling range (sufficient condition) or subadditivity exists given the demand and cost structure of the homogenous market (necessary condition) (for overviews and further details see *Belleflamme* & *Peitz* 2015; *Carlton & Perloff* 2000; *Scherer & Ross* 1990; *Shy* 1995; *Tirole* 1993).

Subadditivity exists when the production of the requested quantity of a homogenous good in one company causes lower total costs than the production of the same quantity in two or more companies. In the case of a multiple product, the same applies. Natural monopolies are virtually always industries bound to pipe or cable networks (water pipe network, energy cable network, etc.), for which no sufficiently close substitutes exist. The telephone cable net used to be a natural monopoly, however, with the emergence of mobile and internet telephony, today this may not be true anymore.

It also becomes clear from these remarks that there is typically no subaddivity at the service level. That is, the digital economy is usually not a natural monopoly because neither the

sufficient nor the necessary condition is met[11], i.e. Google, Facebook, Ebay or Amazon are not natural monopolies. They may enjoy some kind of quasi-monopoly positions, however, they do not represent a natural monopoly in the industrial-economic sense. Naturally, a fixed-cost degression is observable: The more users use a service, the lower the average fixed costs. The same is true for digital goods like e-books, music streams, online videos, etc. While they are characterized by a strong first-copy-cost-effect (strong fixed-cost digression), they do not constitute natural monopolies because they represent heterogeneous goods. The relevant markets are heterogeneous markets consisting of many e-books (e.g. of a specific genre), many music streams or many online videos, respectively.

External Effects

An external effect (or externality) occurs when an actor's utility or profit function contains, apart from its own action parameters, at least one variable that is not (fully) controlled by her but by one (or more) other actors. There is a direct relationship between utility or profit functions of multiple actors. An external (technological) effect can be negative or positive. The benefit or the profit increases or decreases. The external effect is not captured by the market mechanism, i.e. there is no compensation over the price. Examples for a negative external effect would be noise and exhaust fumes, which lead to illnesses. Or noisy party music that robs the neighbor of sleep (negative). A positive external effect may be a beautifully painted garage that the neighbors enjoy every day. One and the same event may cause negative and positive externalities at the same time. An open-air AC/DC concert that can be heard outside the stadium will be negative for classical music lovers, but positive for hard-rock fans. This kind of external effects can be responsible for a market failure.

What causes market failure when technological externalities occur? In principle, too much or too little of a good may be produced because the external effect is not reflected in prices and costs. Potential solutions are the so-called internalization of external effects. The external effects are to be mapped via the market mechanism. For this it is necessary to define property rights. In extreme cases, internalization through government intervention may be useful (e.g. prohibitions, taxes, subsidies, state provision of goods, certificates, etc.). Note that small or minor externalities reduce the efficiency of a market only very marginally and do not require (costly) regulatory intervention (for overviews and further details see *Belleflamme* & *Peitz* 2015; *Carlton & Perloff* 2000; *Scherer & Ross* 1990; *Shy* 1995; *Tirole* 1993.).

[11] There is a fixed-cost digression but no subadditivity!

Public Good

A public good fulfills two criteria, namely non-rivalry in consumption and non-excludability. A private good, on the other hand, is characterized by rivalry in consumption and excludability. For instance, only one person can consume the contents of the bottle of an energy drink (rivalry). Excludability is based on the price: someone who is not willing to pay for a bottle of this energy drink, cannot get one. In contrast, a classic textbook example of a public good is a lighthouse. There is non-rivalry in consumption because the lighthouse does not get better or worse or even disappears when one boat or 1,000 boats use the lighthouse to navigate. There is also non-exclusion from consumption, because it is impossible to let the light shine for one boat but not for an (close-by) other.

It is difficult to identify public goods in the media industry. The frequently (mis-)used example of public broadcasters does not represent a public good in the economic sense. The first criterion, non-rivalry in consumption, is fulfilled: an increasing audience does not harm or benefit the consumption of any single viewer. However, the second criterion, non-excludability, is not given nowadays: it is technologically rather uncomplicated to encode broadcasting signals and provide decoders for paying customers only. Pay TV represents a relevant example. In contrast to Pay TV, public service broadcasters usually deliberately relinquish from encoding their broadcasts as often does advertised-financed commercial TV. However, the economic public good concept refers to the fundamental characteristics of a good – irrespective of political or social purposes or commercial business models. Therefore, neither free broadcasting for social purposes (public service broadcasters), nor for commercial considerations (advertised-financed "free" TV or internet content)[12] constitutes a public good if excludability was technologically and organizationally easily possible – as it is the case here.

If there is a public good, then a financing problem can arise. This is due to the free-rider problem, which implies that everyone wants to be in the user collective but not in the cost collective. Due to the non-excludability, non-payers cannot be excluded from using the good; therefore, everyone has an incentive to use the good without payment – resulting in an under-provision of the good. In this case, alternative financing options must be considered (for overviews and further details see *Belleflamme* & *Peitz* 2015; *Carlton & Perloff* 2000; *Scherer & Ross* 1990; *Shy* 1995; *Tirole* 1993).

[12] For the logic of business models offering content for „free" see section 3.

Asymmetric Information

Asymmetric information exists when players on one market side are less well informed regarding market-relevant aspects than market players on the other side of the market and the players on the better informed market side can strategically use their information advantage to their benefit. Thus, both the demand side and the provider side can be less well informed. A lack of market-relevant information can occur in a quantitative sense, i.e. some information is not known on one market side, or in a qualitative sense, i.e. information on one market side is poor (e.g. false, misleading, or misinterpreted). Asymmetric information often occurs when goods display elements of experience and credence goods. In the case of experience goods, the consumer can assess the quality of the good only after consumption[13], in the case of credence goods not even then. Most media contents are experience goods, for instance, a viewer will only know after watching a movie or a video how good it was. News may even include credence good character because the recipient may not be able to check their trustworthiness. In order for asymmetric information to become a market failure problem, it is necessary that the supplier is better informed. In the case of news-type media content, this will usually be the case. However, despite its experience good character, there is often no information asymmetry with respect to entertainment goods. The supplier does not know either whether a movie or a video will suit the preferences of the viewers (otherwise there would only be commercial successes and no failures in these markets). Whether a viewer finds a comedy video funny is ex ante unknown both to the producer and the consumer – so there is lack of information but no asymmetry that can be strategically exploited.

Information asymmetry may lead to market failure if its strategic exploitation by the better informed market side leads to adverse selection as elaborated by *George A. Akerlof* in his famous essay of 1970, "The Market for Lemons: Quality Uncertainty and the Market Mechanism" (also *Darby & Karni* 1973). He describes why on the American used car market of the 1950s, only bad and no good cars were traded. The reason for this is imperfect information before the transaction: the buyers cannot assess the quality of the car ex ante (experience and/or credence good character). For simplification, *George A. Akerlof* assumes that there are two types of cars of the same type offered, namely "bad" (lemons, considerable shortcomings) and "good" (plums, no shortcomings). The quality of the cars cannot be determined by the potential buyers before the transaction (due to hidden information or hidden characteristics). In contrast, the seller knows the quality of the car, however, the sellers of bad cars

[13] Note that experience good elements do not matter much if the good is bought in a high frequency by the consumer, because then only the first buy really has experience character. Daily products or food represent examples.

experience no incentive to reveal their superior knowledge about the bad state of their cars. The proportion of good and bad vehicles is the same (50 per cent). Buyers are willing to pay $ 2,400 for a good car and $ 1,200 for a bad car. Sellers want $ 2,000 for a good car and $ 1,000 for a bad car, so that mutually beneficial transactions are possible in both market segments.

What are rational buyers under these conditions willing to pay given their lack of knowledge about the quality of the vehicles (asymmetric information to the detriment of buyers) and the probability of catching a good vehicle being 0.5? Or more simply, what is the market price? Rational buyers are willing to pay (at maximum) the expected value, based upon the probability to accidentally catch a good or a bad vehicle, which is as follows: 0.5 x 2.400 + 0.5 x 1.200 = $ 1.800 (under the assumption of risk-neutrality). So what is the result? No good cars ("plums") are sold because the market price ($ 1,800) is below the required price of the supplier ($ 2,000). Only bad cars ("lemons") are sold because the market price ($ 1,800) is above the required price of the provider ($ 1,000). The market for good cars collapses or does not even happen and only bad cars are traded. This adverse selection, thus, leads to market failure. A media example could be a market for news-type contents where cheap but low quality (maybe sensationalist or even fake) news prevail whereas expensive, high-quality news do not find sufficient recipients because the recipients cannot identify the high quality offers with sufficient certainty.

A similar example of market failure would be an insurance market. Here, the asymmetric information is to the detriment of the provider because he cannot know how the insurant behaves after conclusion of the contract. The consequence of having a bicycle insurance, for instance, may reduce the efforts and incentives of the insurant to protect her bike against damage and theft. This increases the frequency of damages and, subsequently, the insurance price. As a result, having a bicycle insurance does not pay-off anymore for individuals taking good care of their bike because insurance prices are very high whereas their individual probability of damage is low. Thus, these so-called good risks are leaving the insurance while only the bad risks are left (moral risk, hidden action, self-selection). The market may collapse or may not even materialize. This so-called moral hazard leads to market failure.

Problems of asymmetric information usually can be alleviated market-internally via screening and signaling. Screening means that players on the less informed market side improves their level of information through self-information or specialized third parties. Consumers of news media content can, for instance, use and compare multiple sources or search for additional information. Furthermore, assessments and experience reports by other consumers like ratings, comments, and reviews may be of help. Similarly, opinions of experts and peers can be

consulted. Signaling means that the better informed market side provides information. This can be done through reputation-building, guarantees, provision of external or independent expertise, offering deductibles or no-claims discount. In the case of news contents, investment – for instance in a net of reporters and correspondents all around the world – can be a quality signal as well. Note that in particular high quality suppliers experience strong incentives to invest in signaling in order to establish and keep alive their market segment. If all these instruments are not sufficient to reduce the exploited asymmetric information, then public regulation may be considered (for overviews and further details see *Hirshleifer* 1973; *Belleflamme* & *Peitz* 2015; *Carlton* & *Perloff* 2000; *Scherer* & *Ross* 1990; *Shy* 1995; *Tirole* 1993).

3 Modern Economic Theory of the Digital Economy

3.1 Platform Economics

Introduction

During the 2000s, the theory of industrial organization was enriched by a new body of theory, which since then has become popular for media economics analyses, in particular regarding online media as well as digital goods (*Anderson* & *Gabszewicz* 2006). Originating from the analysis of markets for payment systems like credit cards, the theory started under the label *two-sided markets* (pioneered[14] by *Rochet* & *Tirole* 2002, 2003, 2006; *Armstrong* 2006; *Evans* & *Schmalensee* 2007, 2015; see also *Haucap* & *Stühmeier* 2016). In the course of time, however, the more general and less misleading[15] term *platform economics* has established itself.

A platform is a supplier of goods (products or services) to two or more customer groups characterized by three constitutional characteristics:

(1) The customer groups are *distinct* (distinguishable and delimitable from each other),
(2) The customer groups are indirectly connected with each other via indirect network effects (INE).
(3) These INE cannot or only to a limited extent be internalised by the customer groups because transaction costs prevent or hamper side-payments and arbitrage.

[14] An important predecessor is *Demange* & *Gale* (1985).

[15] The term two-sided markets – referring to two demand sides of the market – may be misleading because every market actually has two sides – supply and demand. Furthermore, there may be markets with three or more demand sides (multi-sided markets).

In the original case of payment systems (like credit cards) the supplier of the payment system sells its service to the customer group (i) consumers, using it for payment in shops, and (ii) shop owners, accepting it from consumers.

Network Effects

The crux of platform economics is the INE between the two customer groups. Direct network effects (DNE) describe the case where an increasing number of network members increases the individual utility for network users, both incumbents and newcomers (*Farrell* & *Saloner* 1985; *Katz* & *Shapiro* 1985). Social media networks (like Facebook, Twitter, LinkedIn, etc.) represent an example: if more of your friends are joining the network, the utility derived from the network services (communicating, social interacting, etc.) for yourself and for each of your friends increases. While DNE, thus, work within the same customer group, INE work in a similar way but between distinct customer groups. Consumers, for instance, derive a higher utility from holding and using a payment system (a certain credit card, for instance) if they can pay with it in many shops. Consequently, if more shop owners (customer group ii) decide to accept the payment system, the utility of consumers (customer group i) increases – and so does their demand of the payment system. This is a positive INE (increasing participation of customer group (ii) leads to an increasing participation of customer group (i)). And in the case of payment systems the positive INE runs in both directions: shop owners find it more interesting to accept a given payment system if many consumers are willing to pay with it. Thus, an increasing participation of customer group (i) also increases demand by customer group (ii).

The platform needs to manage the two (or more) demand sides like a chicken-egg-problem (*Caillaud* & *Jullien* 2003): it needs to attract sufficient numbers from both customer groups in order to get the service running. If the INE between the customer groups are not equally strong in each direction (which is empirically the usual case), then the platform faces incentives to attract especially those customers whose group exert the stronger positive INE on the other customer group. If, for instance, boys strongly focus on going to clubs where many girls are, whereas girls see the presence of many boys as a less relevant criterion for going into a club (but still a positive one), then the club owner acts fully rational if she concentrates on attracting girls (free entry, bonus drinks, atmosphere, music selection, etc.) and expects boys to join automatically if successful. This involves an important implication of platform economics: the price structure may be asymmetric in the sense that the customer group exerting the stronger INE will be priced very low (up to zero or even with negative prices) whereas the other customer group is priced so high that it covers the costs of serving the first group as well. If girls get free entry plus bonus drinks in a club (a negative price!), then

boys entrance fee plus consumption must cover these costs as well. This asymmetric price structure considerably differs from pricing on "ordinary" markets. Commonly, the literature distinguishes transaction platforms from non-transaction platforms. In the first case, transactions between the distinct customer groups are directly consummated via the platform or at least directly observable for the platform. Non-transaction platforms require a platform-external transaction after the mutual attention for the transaction partner has been created by the platform.

INE may also be one-sided or even negative, which is often the case in platform media markets. A prime example are content providers on the internet who offer their content for free (a price of zero) and finance themselves through advertising revenues (predominantly non-transaction platforms like, for instance, online newspapers and magazines, social networks, search engine services, price comparison services, audio and video streaming services, etc.). Here, the distinct customer groups are (i) users of the content and (ii) advertisers buying advertising space from the platform. The INE from users to advertisers is positive: if more users are visiting the content provider's website, then advertisers find it more attractive to place their advertising. However, the other way around, the direction of the INE is not so clear. Actually, many users may find the advertising disturbing and constituting a disutility. If this is the case, then the INE from advertisers to users is negative: more advertising will reduce demand by users. Similar examples are advertising-financed television or partly advertising-financed printed newspapers and magazines. Logically, the platform will focus on attracting the customer group exerting the positive INE by subsidizing it (free content) and by trying to design its service in a way that the advertising is both as effective as possible (increasing the willingness-to-pay of advertisers) and as little disturbing as possible (increasing participation of users, which in turn also increases the advertisers' willingness to pay due to better reach). This has fueled many innovations in advertising placing and design (search advertising, sophisticated types of targeted advertising, influencer marketing as a new form of product placement, native advertising, etc.) as well as in advertising pricing models (pay-per-view, pay-per-click, etc.).

Platform Competition

The importance of platform economics for modern media economics is also related to the explanation of the phenomenon that some digital/online markets are characterized by dominating, almost monopoly-like platforms while others are not. Modern platform economics has clearly developed that while monopolies are more efficient on platform markets than on "ordinary" markets (due to the internalization of INEs), still competition among platforms is better for welfare, in particular in the medium- and long-term. Industrial organization theory

is analyzing the features of platform markets in regard to their effect on competition among versus monopoly of platforms (*Evans* & *Schmalensee* 2007; *Haucap* & *Heimeshoff* 2014; *Haucap* & *Stühmeier* 2016). This research is still ongoing but the following factors have already been identified to promote sustainable platform competition (and their opposite to promote dominant positions of single platforms):

- weak and/or asymmetric INE,
- weak DNE,
- multi-homing by customer groups, i.e. customers regularly using more than one platform,
- size of the market, i.e. the larger the market, the more platforms may be able to attract a sufficient number of customers of each group,
- heterogeneity of customer preferences, i.e. if the needs of customers differ within the customer groups, different platforms may specialize on different needs (like Facebook on private social interacting, LinkedIn and Xing on business social interacting, Snapchat on very young users, etc.),
- (accompanying) heterogeneity of platform services,
- compatibility among platforms, i.e. interconnectivity of users of different platforms and low switching costs,
- innovation dynamics,
- etc.

Different platform markets will meet these factors in different ways, thus, being more or less prone to being dominated by a single platform. However, once platforms enjoy market power, they can also strategically shape the platform market conditions in anticompetitive ways, for instance, by deliberately creating incompatibilities and switching costs, standardizing platform services, encouraging single-homing, reinforcing positive DNEs and INEs, and many more.

The issue of welfare also relates to the distinction between natural and artificial platforms. Natural platforms describe markets where transactions are impossible without the intermediary service of a platform (= transaction costs are prohibitive with the platform service), whereas artificial platforms describes markets which could be organized in an "ordinary" way but where companies strategically chose to turn its business into a platform. Payment systems are an example of natural platforms, whereas online shops are an example of artificial platforms. An online shop can organize itself as an "ordinary" retailer, i.e. buying goods from producers or wholesalers and resell the goods to consumers. Note that this is part of a vertical supply chain and does not constitute a platform! Alternatively, however, an online

shop can organize itself as a platform offering other shops, producers, and wholesalers virtual shop space on its platform and focus on bringing sellers and buyers together as a matching service, perhaps accompanied with transactions services (like payment services, customer complaint services, search and recommendation services, rating services, etc.). The online shopping giant Amazon, for instance, once started as an "ordinary" retailer and still runs a considerable part of its business like this. Later on, it added a shopping platform ("Amazon Marketplace"), where it turned part of its retailing business into a platform business (*Budzinski* & *Köhler* 2015). The distinction between natural and artificial platforms is particularly relevant if platforms tend towards monopolistic positions: in the case of a natural platform, the quasi-monopoly may be acceptable for society due to the otherwise impossible internalization of INE, whereas in the case of an artificial platform, it represents a deliberate monopolization strategy not determined by the nature of the market and detrimental to social welfare. (Social/digital) Media platforms are usually artificial platforms; the advertising revenue model represents only one out of several possible organization options.

3.2 Sharing Economy

Introduction

The sharing economy enjoys growing popularity, not only amongst its users but also in the scientific discourse (for a detailed overview and further information see *Dittmann* & *Kuchinke* 2017).[16] On the one hand, it is described as an innovative, resource-saving and welfare increasing way of organizing the economy (*Zobrist* & *Grammp* 2015: 4; *Rauch* & *Schleicher* 2015: 11; *Koopman* et al. 2014: 5, 2015: 2; *Demary* 2015: 7), on the other hand some concerns arise regarding market conduct and the regulation of sharing enterprises. It is argued that there are no market conduct rules for these enterprises, as existing rules of traditional markets cannot easily be adapted to the sharing economy and governments have not responded to the growing importance of these companies so far by creating fitting laws (*Rauch* & *Schleicher* 2015: 5).

[16] Since we discuss the sharing economy, we focus on commercial, i.e. paid-for, sharing in contrast to non-economic, private sharing without any payment by the user. Note that non-for-profit sharing, i.e. a price covering costs but not yielding profits, represents an economic activity.

Literature and Status Quo

A universal definition of the sharing economy could not prevail so far. Basically, the term sharing economy describes a particular way of exchanging products or services through a web-based platform (*Koopman* et al. 2015: 2; *Bond* 2015: 77; *Hamari* et al. 2015; *Fraiberger* & *Sundararajan* 2015: 5; *Cusumano* 2015: 32). Thereby, peer-to-peer sharing and so-called asset hubs have to be distinguished. In the case of peer-to-peer sharing (like Uber or AirBnB), the sharing company acts as an intermediary between buyers and sellers of certain goods.[17] The transaction itself takes place exclusively between the suppliers and buyers, whereas the platform limits its activities to the mediation between both sides of the market. While the platform represents the sharing company, the exchange of services is usually concluded between private individuals. Already existing resources are exchanged ("shared"), so that no new resources are claimed. Instead, the existing ones are led to better utilization, which can result in decreasing fixed costs (*DuPuis* & *Rainwater* 2015: 2; *Zobrist* & *Grammp* 2015: 4; *Schor* 2014: 3). In contrast to the peer-to-peer sharing, asset hubs (like car rental or DriveNow) offer their own resources for use and, thus, act as a traditional supplier of goods. As asset hubs show no considerable differences to standard economic relations, they are excluded from the following analysis.

A number of special features are assigned to the sharing economy, which are also viewed to be its main economic advantages. Some authors emphasize that the sharing economy leads to a significant reduction of information asymmetries (see section 2.3) between buyers and sellers of goods through providing access to online evaluations by other users in forums, social networks or own review sites. Hence, both sides of the market may inform themselves extensively about the characteristics of the opposite market side. The facilitated access to relevant information leads to a decline of search and information costs and, therefore, ultimately to a significant reduction of transaction costs. Falling transaction costs, in turn, allow for the supply and demand of any small quantities, resulting in the so-called disaggregation of the offer. Thus, the sharing economy may be able to better adapt to the individual needs and preferences of consumers than conventional transactions. At the same time, the possibility to split supply into arbitrarily small amounts as well as the use of temporarily unused assets or skills could cause a better utilization of existing resources. According to this argumentation, the sharing economy could contribute to the reduction or even the overcoming of the scarcity problem and increase social welfare. The described higher degree of flexibility

[17] Note that it constitutes a commercial transaction if you temporarily allow an individual to use a good belonging to you in exchange for some monetary recoupment. Renting you flat out on AirBnB or giving someone a paid-for ride via Uber represent commercial transactions where a service is supplied by one individual and consumed by another.

also extends to the pricing of goods (*Skift Report* 2013: 22; *Rauch* & *Schleicher* 2015: 17). Sharing companies may adjust both the type of offered services as well as the prices better to the individual users' needs and preferences.

Sharing companies often compete with traditional companies in the same or related markets, for instance Uber with traditional taxi services or AirBnB with the traditional hotel industry. This has raised concerns about violations of existing regulations in these markets by sharing companies and an unfair advantage of sharing companies over existing businesses, perhaps even threatening their commercial existence. Due to the different business model, it is sometimes controversial whether sharing companies must follow 'old' industry regulations whereas, at the same time, there are no special market conduct rules for the sharing economy so far. Since the 'old' industry regulations often appear inadequate for the nature of sharing businesses or could even sometimes threaten the underlying business model, some authors welcome the resulting regulatory freedom and claim that the sharing economy could regulate itself (*Horney* 2015: 3). Other authors, however, see a number of problems from regulatory freedom, in particular regarding issues of safety, accountability, and responsibility as well as liability for taxation.

The problem of different regulation of traditional and sharing companies created many legal and political controversies. For instance, the market entry of the US driving service Uber led to massive resistance from traditional taxi service companies. As in several other countries, the German courts responded with a general prohibition of UberPOP. An authorization would not be applicable, neither as a taxi or as car rental company nor could specific paragraphs be applied as exception rule on Uber, as the US driving service would not meet the necessary requirements for that, offering a free or cost-covering transport. Taxi services are still considered as an element of general interest and as an "outstanding important common good" by the Constitutional Court. A provision by other modes of transport is being rejected. New features like Ubers' would present a risk for the functioning of German taxi services markets. In Spain, the Netherlands, Indonesia and Thailand, Uber was banned in 2014, France followed in 2015. In New York City, there are efforts to limit the annual growth by law to 1 per cent p. a. In addition, the effects of Uber's activities on the environment and (local) public transport sector ought to be monitored. However, attempts to specify a regulatory framework tailor-made to the nature of sharing businesses have failed to appear so far. With the exception of the growth restriction in New York City, legislators have shown no aspiration to overcome the existing problem that would exceed beyond a general ban of Uber.

Sharing Economy and Platform Economics

When considering the above description of the sharing economy, the proximity to platform economics (see section 3.1) becomes immediately clear. Let us have a look on Uber and AirBnB as sharing platforms in comparison to the taxi service app myTaxi and the hotel-booking service HRS as more traditional platforms. Both Uber and AirBnB show the typical characteristics of price setting behavior that fit the description of behavior in platform economics: the demand group possessing the lower indirect network effect must pay a higher price than the demand group exerting a higher indirect network effect. Thus, no particular distinctions of sharing platforms to other (digital) platforms can be seen. However, what about the other special characteristics and advantages referred to in the literature?

The reduction of information asymmetries represents a key feature of the sharing economy. On closer inspection, however, its case is not so clear. Using different review sites, social networks and forums to gather pre-transaction information is not limited to users in the context of the sharing economy but open to all customers for any kind of product or service. The scope of the available information is determined by the willingness of individuals to share their experiences (with suppliers or other users, their products, prices and quality in the internet) with others, and not by the nature of the subsequent transaction (i.e. a 'sharing' transaction via Uber or a 'traditional' transaction via Amazon). Individuals could, for example, collect information about a particular good on the internet and then purchase it offline in a traditional store. Hence, this cannot be seen as constituting characteristic of sharing economy. The potential for reducing information asymmetries is rather the result of an increasing distribution and use of the internet as well as an increasing exchange of information about personal experiences on the internet. Therefore, it is difficult to see how sharing transactions generate an information advantage compared to other transactions, in particular other transactions involving online platforms. Similarly, the accompanying reasoning that the sharing economy lowers transactions costs cannot be supported as well; again, it is more an effect of digitization in general.

A critical view on the earlier described disaggregation of offers and, hence, the resulting supply flexibility reveals doubts to whether the sharing economy necessarily allows for smaller and, therefore, more individual quantities of goods than other (digital) platforms, traditional brick-and-mortar stores or the traditional service sector. For instance, rides in taxis serve as transportation from an individual starting point to an individual destination just like Uber, nights in a hotel or a holiday flat do not systematically differ from booking nights via AirBnB, many food and daily products can be bought in virtually all quantities, and garments can be rented from theaters. These anecdotal counter-examples do disprove cases, in which

the level of aggregation in the sharing economy actually is lower. However, they demonstrate that disaggregation and supply flexibility do not represent an exclusive, distinctive feature of sharing arrangements.

Now, what about pricing flexibility? Most of the currently prominent sharing companies entered markets that are characterized by a high level of public regulation, like for example Uber and AirBnB. Taxi service markets are, inter alia, regulated in terms of payments and safety standards. Likewise, hotels and similar services face numerous regulatory standards. So far, neither Uber nor AirBnB meet comparable specifications – or 'just' pay taxes to a comparable extent. Therefore, higher pricing flexibility is indeed not surprising given the significant lower costs due to the non-compliance with regulation. Thus, higher pricing flexibility is not a characteristic of the sharing economy but rather a result of the ignorance of existing regulations.

Eventually, what can we conclude about the ecological advantages of the sharing economy due to a better utilization of otherwise unused resources and overall lower consumption-levels of resources? For a closer look on this blanket argument, we need to distinguish goods, which are no longer used, from the ones that are only not being used temporarily. If a good is no longer required, it does not make a difference for its utilization whether it is leased to other individuals via the sharing economy or sold on eBay, Amazon or a flea market. Here, also no fundamental characteristic of the sharing economy surfaces. In contrast, the utilization of temporarily unused resources may well increase if, for instance, a private car is used as an Uber vehicle. However, with more intensive utilization the wear regarding the vehicle is also increasing, so that the product life cycle is reduced and it has to be replaced earlier. The short-run resource conservation may, therefore, be offset in the medium- to long-run depending on the characteristics of the goods. The total environmental effects are not evident.

In summary, the essential difference between the sharing economy and more traditional business is the degree of price flexibility. However, this does not result from the nature of the sharing economy but from a mismatch of sharing business models with 'old-fashioned' industry regulation (*Dittmann* & *Kuchinke* 2017). Next to representing an example of platform economics in many regards, the sharing economy also commercializes the use of personalized data – a phenomenon with which we deal in the following section.

3.3 Economics of (Big) Data, Privacy, and Online Communication

Introduction

The phenomenon that some services and contents, especially via the internet, are offered ostensibly "for free" (in terms of a monetary price in common currency) is receiving increasing attention in the economics of industrial organization. In particular online communication services like social media networking (e.g. Facebook, Twitter, Instagram), messenger services (like WhatsApp) or online telephone and videophone services (e.g. Skype) but also searching services (e.g. Google, Bing), (price) comparison services (e.g. Nextag, PriceGrabber) or booking services (e.g. Booking.com, HRS) can be used by everyone for the monetary price of zero. The same is true for various contents (e.g. YouTube, news platforms, smartphone apps, etc.). While platform economics already offers a theory explaining zero prices towards one demand side (users), subsidized by the other demand side (advertisers) (see section 3.1), the context of big data analytics and privacy concerns has recently revived an older discussion from economics dealing with the incentives to provide personalized data and the effects of its usage for commercial purposes.

Personalized data includes both (i) "classic" registration data like email addresses, names, sex, age, perhaps residence information, maybe even account/payment information and (ii) "advanced" behavioural data that allows for conclusions and conjectures regarding the preferences and the commercial behaviour of consumers. This advanced data may consist of personalized data about individual (online) browsing, searching and buying histories (revealed preference data) as well as preference-related statements of users through posts, comments, ratings, (Facebook-)"likes", etc. (stated preference data). Additionally, individual movement profiles, collected through the location function of mobile devices, and other personalized data may complement the information. Pooling such data yields more or less accurate individual consumption patterns, from which reasonable hypothesis about individual consumer preferences may be derived.

The older literature from the 20th century focused on asymmetric information effects, i.e. one market side enjoys better information about personal data than the other side (see section 2.3): situations in which consumers behave (hyper-) rational and smart, whereas service providers suffer from information disadvantages (inter alia, *Hirshleifer* 1971, 1980; *Stigler* 1980; *Posner* 1981; *Varian* 1997; overview: *Acquisti* et al. 2016). In this Stigler-Posner-Varian (SPV) world, an enhanced use of personalized data increases efficiency and welfare because information asymmetries are reduced and strategic behavior of the consumers at the expense of service providers frustrated. At the same time, data-based abuse of market power is rather unlikely. Consequently, this literature focuses on setting incentives for consumers

to reveal more personalized data (*Posner* 1981) as long as this increased information provision is not predominantly waste (*Hirshleifer* 1980; *Akerlof* 1976).

Data-driven Markets

In the light of the digital economy, however, new insights surfaced. The focus of the literature gradually shifted towards when, how, by whom and for what commercial purposes companies use personalized data of consumers as well as towards the commercial value of this data (inter alia, *Taylor* 2004; *Acquisti* & *Varian* 2005; *Gross* & *Acquisti* 2005; *Hermalin* & *Katz* 2006; *Hui* & *Png* 2006; *Grossklags* & *Acquisti* 2007; *Beresford* et al. 2012; *Brown* 2016; *Heidhues* et al. 2016; *Hoffmann* et al. 2016; *Kerber* 2016; *Obar* & *Oeldorf-Hirsch* 2016; *Heidhues* & *Köszegi* 2017). As a consequence, information asymmetries are often reversed compared to the SPV world and consumers frequently find it to behave fully rational. Along with the growing popularity of behavioural economics approaches in industrial organization, empirically well-supported phenomena like (i) non-utilization of available information, (ii) framing and anchoring effects, loss aversion, salience as well as satisficing behaviour, and (iii) the presence of naïve consumers (i.e. consumers who do not correctly anticipate the economic interrelationships of their actions and decisions and, consequently, act overly trustful; *Heidhues & Köszegi* 2017) are increasingly targeted. Put somewhat simplifying, if consumers behave "only" bounded-rational and/or naïve, whereas service providers enjoy information advantages about the use and value of personalized data (information asymmetries in favour of the service providers), then effects are likely to differ from the SPV world. In this behavioural-economics world, considerable scope for databased profits at the expense of consumer welfare surfaces, in particular in combination with market power.

We distinguish three fundamental types of databased markets:

(1) paying with data markets where personalized data serves as payment or currency,

(2) data trading markets where (bundles of) personalized data are the object of transactions, and

(3) markets for data extraction and protection technologies where the development of more sophisticated extraction and analysis software (fuelled by demand from data-selecting and -using companies) competes with the development of advanced blocking software (fuelled by demand from data-protecting consumers as well as collected data-protecting companies).

The latter market type (3) is particularly relevant for the extent of asymmetric information and the asymmetry of power in databased markets. Sophisticated extraction technologies may collect data without the awareness of the consumer. Already now, many internet users

are unaware of the number of cookies (tracking programs installed on your computer when visiting websites) regularly tracking their internet surfing behavior and the extent of data collected this way – not to speak about the subsequent commercial use of this data. Moreover, the German Facebook antitrust case reveals that personalized data may be collected by a company even if the user does not visit the website or uses the service: already visiting a site with a Facebook interface (e.g. a like-button) is allegedly sufficient for the social media operator to track the data (*Budzinski & Grusevaja* 2018). Blocking technologies (ad-blockers being a simple example), on the other hand, empower the user to keep control of her personalized data. If the "race" between extraction and protection technologies is head-to-head, then this promotes efficiency and welfare (*Acquisti & Varian* 2005). However, if extraction technologies, due to the financial power of the big online companies, out-develop combating protection technologies due to unorganized or bounded-rationally ignorant users, then negative consumer welfare effects must be expected. Protection software shielding companies collected stock of data against digital thieves and pirates represents a different branch of this market.

If bundles of personalized data possess commercial value, then markets where these data bundles are traded (type 2) promote an efficient allocation (*Varian* 1997; *Acquisti & Varian* 2005). However, one problem refers to the knowledge of the original provider of the data: does she stand a chance to anticipate the further use of her data if it gets bundled and sold by the original data collector? If not, inefficiencies and privacy concerns may arise (*Varian* 1997; *Acquisti & Varian* 2005). Another problem relates to the value of big data. It is not so much the data itself that promises commercial value; instead the tools and competencies to meaningfully pool, combine, and analyze the data so that commercially valuable conclusions can be drawn represent the scarce resource (*Schwalbe* 2018).

Databased Business Models

Internet users are mostly confronted with type (1) of databased markets where they "pay" for a good (service, content) by providing their personal data either instead of having to offer traditional money (i.e. monetary price of zero) or receiving a (implicit, tacit) monetary price discount. The industrial organization literature asks both why are these business models profitable for companies (relinquishing revenue; they could have sold this service or content) and what are the consumer welfare effects? Presently, three databased business models are particularly discussed:

(i) *Targeted advertising* describes the case where personalized data about the user, especially advanced behavioral data, serves to personalize advertising according to the databased-conjectured preferences of the user. This is the phenomenon that platform economics are explaining (see section 3.1). Users consuming the zero-priced services and contents pay with their attention and get confronted with more or less sophisticated advertisings. Target advertising further improves profitability of managing the INE because if users receive advertising about goods they – according to the collected personalized data – like, then the probability of a successful advertisement should be increased and the annoyance factor of the advertising (the negative INE on the user) should be decreased. Since databased targeted advertising is more effective, advertisers are willing to pay more for it and profits of the platform increase. However, the effects on consumer welfare are ambivalent. On the one hand, targeted advertising should be less disturbing than 'ordinary' advertising (*Acquisti* & *Varian* 2005; *Tucker* 2012). On the other hand, however, the amount and intrusive character of advertising may increase, advertising avoidance costs rise, and privacy concerns surface (*Hui* & *Png* 2006; *Anderson* & *de Palma* 2012; *Tucker* 2012).

(ii) Based upon personalized data, companies *individualize services*, tailor-made to the individual user, which are either a good in itself or a means to facilitate the buying of other goods (i.e. reducing transaction costs). Examples include databased search services, which provide a ranking of results that fit the preferences of the individual user (e.g. Google Search), as well as databased recommendation services that suggest other goods based upon the consumption history of the individual user and other users (e.g. Amazon, YouTube, Netflix, Spotify, etc.). These individualized services induce additional consumption and, thus, increasing turnover and revenues – and are often an important element of their suppliers' commercial success. At the same time, shaping digital goods according to the preferences of the consumers should typically also increase consumer welfare (*Acquisti & Varian* 2005).

(iii) Very sophisticated personalized data analysis (e.g. pooling individual search and consumption patterns with personal preference statements) may allow companies to approximate the individual willingness-to-pay of users for a given good, so that they may charge different consumers different prices for the same product or service (databased price discrimination). In theory, such individualized prices could come close to first-degree price discrimination. However, firstly, the quality and the quantity of the data need to be excellent enough to allow for sufficiently

precise approximations. Secondly, market transparency reduces the scope for databased price discrimination (for instance, online easily available – and unbiased – price comparison services). Thirdly, effective competition probably erodes high margins from price discrimination.[18] In a SPV-world, databased price discrimination may have welfare-increasing effects due to efficiency gains and an expansion of quantities. Notwithstanding, consumers' rents will obviously be transferred into producers' rents when companies can price each consumer at the maximal price this consumer is willing to pay (distribution effect). In a BE-world, negative consumer welfare effects are likely to more prevalent, in particular in combination with heterogeneous goods (i.e. product/service differentiation or even individualization), lock-in effects and switching barriers, relevant information asymmetries at the expense of consumers (*Taylor* 2004; *Hermalin* & *Katz* 2006), information deficiencies about how personal data is used (*Acquisti* & *Varian* 2005), low competition intensity, i.e. a lack of alternatives for consumers (*Kerber* 2016), as well as the presence of naïve and/or bounded-rational users (*Hoffmann* et al. 2016; *Heidhues* & *Köszegi* 2017). Furthermore, negative dynamic effects may occur, for instance the survival of inferior goods in the market (*Heidhues* et al. 2016).

Modern online media markets often display the characteristics of the BE-world rather than the SPV-world. Online communication markets serve as a prime example. Communicating online can take place, for instance, via emails, messenger services, direct audio and video connections, or social media. Many of these services require the user to sign in to a network or a platform, like, for instance, the popular Facebook services (including its subsidiaries WhatsApp and Instagram). Users need to agree with the terms and conditions of usage, including privacy rules. In a SPV-world, we assume that potential users utilize the available information about terms, conditions, and privacy and then make an informed and rational decision whether to join the network and/or download the application. However, empirical analyses demonstrate that users tend to ignore the available information due to its sheer length and information overload problems, due to complicated language (often because of legal requirements) and due to the feeling that they have no choice anyway (*Gross* & *Acquisti* 2005; *Obar* & *Oeldorf-Hirsch* 2016). At the same time, many users do actually care about privacy and state privacy-related objections to far-reaching data usage terms and conditions

[18] While such sophisticated databased price discrimination systems do not appear widespread nowadays (which may change in the future, though), more rudimental versions exist where prices are adjusted according to more general information about platform-specific search histories, location and time of buying, type of computer device used, etc. often combined with dynamic pricing elements (e.g. online airline ticket sale platforms). Amazon temporarily test-tried a databased price discrimination system in the U.S. See *Budzinski* & *Köhler* (2015).

when asked in surveys or interviews. This phenomenon – a conflict between revealed preferences and stated preferences – is usually called the privacy paradox (inter alia, *Grossklags* & *Acquisti* 2007; *Beresford* et al. 2012). Its widespread existence points towards a BE-world being the more appropriate framework for analyzing online communication.

4 Implications for Competition Policy and Regulation

The policy implications of industrial organization theory relate to competition policy and sector-specific regulation. Competition policy, on the one hand, applies a framework of competition rules with the aim of protecting competitive markets from inner erosion and preserving the welfare effects of the process of competition (see section 2.2; for detailed overviews on competition policy see *Motta* 2004; *Blair* & *Sokol* 2015). The competitive market process may be inherently eroded by collusive arrangements among competitors, i.e. when companies cooperate on dimensions of competition like prices, quantities, market division, innovation, etc. at the detriment of consumers and society. Cartels refer to contractual collusion, tacit collusion or coordinated effects to non-contractual collusion. Another way of eroding competitive forces may be an increasing concentration creating market power for dominant companies (up to (quasi-)monopolies). While dominance cannot be completely prevented (see section 2.2), merger control seeks to limit anticompetitive concentration through merging with or acquiring other companies. Companies that nevertheless enjoy market powerful positions (perhaps because of past breakthrough innovation), irrespective of how they came into these positions, are not allowed to abuse this dominant position at the detriment of consumers, society, and sometimes also smaller competitors. Although the competition rules differ in detail from jurisdiction to jurisdiction, anti-cartel policy, merger control, and abuse control are nowadays the common three pillars of virtually all competition policies around the world, existing in more than 100 countries worldwide (*Budzinski* 2015). Sector-specific regulation, on the other hand, aims to correct market failure (see section 2.3), but is often also driven by influences from lobbyism and political failures. Thus, its economic effects are often controversial and, in many cases, deficient regulation actually reduces welfare.

Traditionally, media industries were heavily regulated in many countries. Telecommunications and postal services represent a typical case where comprehensive regulation or even governmental organization of the sector used to be prevalent. The natural monopoly of

physical cable nets serves as economic justification for governmental interrogation and regulation (see section 2.3).[19] However, technological progress like mobile telephony virtually eroded most of the natural monopoly character and, consequently, also most of the economic justification for sector-specific regulations. Notwithstanding, elements of natural monopolies may still exist if, for instance, broadband internet access is only possible through access to a physical fiber-optic cable net.

Another area of sector-specific media regulation in many countries is broadcasting services like television and radio. Typically, the motivation starkly differs in this case: some countries regulate broadcasting media in order to protect and preserve the freedom and diversity of opinion, other countries rather for the opposite reasons. Thus, public service broadcasters may either be comparatively independent cornerstones of a free and diverse media system or biased advocates of the government – in the first case protected in its existence by regulation, in the second case protected from competition by regulation. From an economic perspective, the problem of asymmetric information combined with elements of credence good character of news may justify some regulation although modern research on the (industrial) economics of media bias point to competition as a more effective instrument to limit bias, favoring a strict competition policy over sector-specific regulation.

Like virtually all other industries, media industries are subject to competition law and policy. While cartels and collusive arrangements do not have a prominent case record in media industries (with some exceptions), merger control plays an important role. Several media industries like telecommunications or the music industry experienced considerable concentration tendencies on an international scale. In the latter case, for instance, the market structure of record companies halved from formerly six majors some 20 years ago (Universal, Sony, Warner, EMI, BMG, PolyGram) down to three (Universal, Sony BMG, Warner) today. In the markets for social networks and online messenger services, the 2014 acquisition of WhatsApp by Facebook was cleared by competition authorities in Europe and the U.S., a decision that received scholarly criticism because of a lack of adequate application of the economics of personalized data (see section 3.3) by the competition authorities (*Deutscher* 2017; *Budzinski* & *Stöhr* 2018). In 2018, U.S. antitrust authorities tried to block the merger between telecommunications giant AT&T and leading media content company Time Warner due to severe anticompetitive concerns, however, failed to convince the law courts of the first instance – a judgment whose reasoning receiving critical reviews from an industrial or-

[19] Note that the historical reasons for regulated or state-organized postal and telecommunication services were often politico-military rather than economic.

ganization perspective (*Caffarra* et al. 2018; *Salop* 2018). The German competition authorities, on the other hand, successfully blocked both a merger between leading newspaper publisher Springer and commercial television provider ProSiebenSat.1 in (*Budzinski* & *Wacker* 2007; *Kuchinke* & *Schubert* 2006) as well as a cooperative VoD platform by leading commercial TV stations in the 2000s (*Budzinski* & *Lindstädt-Dreusicke* 2018).

With the upcoming relevance of digital and online media platforms, abuse control gained importance in media competition policy, in particular because platforms tend towards powerful market positions due to network effects (see section 3.1) but also because of the often global business of these platforms. Already in the 1990s and early 2000s, competition authorities around the world targeted a number of Microsoft's business practices abusing the market power from their then dominating operating system including practices like raising rivals' costs, foreclosure, bundling and tying, exclusive contracts, etc. (*Fisher* & *Rubinfeld* 2001; *Gilbert* & *Katz* 2001). Some of the charges against Google regarding its Android business practices resemble this case (*Vezzoso* 2018). However, with its dominating search engine, Google additionally faces allegations regarding search bias, i.e. deliberately manipulating its search algorithm to benefit its own subsidiary services at the expense of competitors and consumers, as well as regarding abusive practices in online advertising (*European Commission* 2017, 2018). European competition authorities sentenced a € 2.42 billion fine in the search bias case. Also, the market power and related business strategies of companies like Amazon, Apple, Facebook, Spotify and others receive increasing attention by competition authorities.

All these cases demonstrate the relevance of up-to-date industrial economics knowledge about modern media industries because both competition policy enforcement and sound regulation needs to be rooted in comprehensive economic analysis. Digitization and the internet have considerably changed the business world and fuelled concentration trends and the emergence of powerful international market positions by single companies. These developments promote a discussion whether competition policy suffices to control modern media industries or whether there is a need for adapted competition rules or even new regulation. While we think that adapted competition rules and reinvigorated antitrust policies should suffice to enforce procompetitive behavior by platforms and data-driven businesses in the online world (*Budzinski* & *Stöhr* 2018), we emphasize the necessity of regulatory changes to accommodate a fair, level-playing field competition of sharing economy companies with more traditional business models (*Dittmann* & *Kuchinke* 2017).

References

Acquisti, A. & Varian, H. R. (2005), Conditioning Prices on Purchase History, in: Marketing Science, 24(3), 367-381.

Acquisti, A., Taylor, C. R. & Wagman, L. (2016), The Economics of Privacy, in: Journal of Economic Literature, 54(2), 442-492.

Akerlof, G. A. (1970), The Market for "Lemons": Quality Uncertainty and the Market Mechanism, in: Quarterly Journal of Economics, 84, 488-500.

Akerlof, G. (1976), The Economics of Caste and of the Rat Race and other Woeful Tales, in: The Quarterly Journal of Economics, 90(4), 599-617.

Anderson, S. P. & Gabszewicz, J. (2006), The Media and Advertising: A Tale of Two-Sided Markets, in: Handbook of the Economics of Art and Culture, Vol. 1, Amsterdam: Elsevier, 567-614.

Anderson, S. P. & de Palma, A. (2012), Competition for Attention in the Information (Overload) Age, in: RAND Journal of Economics, 43(1), 1-25.

Armstrong, M. (2006), Competition in Two-Sided Markets, in: Rand Journal of Economics, 37(3), 668-691.

Arrow, K. J. (1969), The organization of economic activity: issues pertinent to the choice of market versus non-market allocations", in: The analysis and evaluation of public expenditures: the PPB system; a compendium of papers submitted to the Subcommittee on Economy in Government of the Joint Economic Committee, Congress of the United States, 1, Washington, D.C.: Government Printing Office, pp. 47-64, OCLC 26897.

Arrow, K. J. (1991), The Economics of Agency, in: Pratt, J. W. & R. J. Zeckhauser (eds.), Principals and Agents: The Structure of Business, Boston, 37- 55.

Bain, J. S. (1959), Industrial Organization, New York.

Belleflame, P. & Peitz, M. (2015), Industrial Organization: Markets and Strategies, Cambridge: Cambridge University Press.

Beresford, A. R., Kübler, D. & Preibusch, S. (2012), Unwillingness to Pay for Privacy: A Field Experiment, in: Economics Letters, 117(1), 25-27.

Bertrand, J. L. F. (1883), Book review of "Recherches sur les principes mathematiques de la theorie des richesses", in: Journal de Savants, Septembre, 499-508.

Blair, R. D. & Sokol, D. D. (2015; eds.), The Oxford Handbook of International Antitrust Economics, Vol. 1 & 2, Oxford: Oxford University Press.

Bond, A. T. (2015), An App for that: Local Governments and the Rise of the Sharing Economy, in: Notre Damee Law Review, 90(2), 77-96.

Brown, I. (2016), The Economics of Privacy, Data Protection and Surveillance, in: Bauer, J. & Latzer, M. (eds.), Handbook on the Economics of the Internet, Edward Elgar: Cheltenham, 247-261.

Budzinski, O. (2015), International Antitrust Institutions, in: R. D. Blair & D. D. Sokol (eds.), The Oxford Handbook of International Antitrust Economics, Vol. 1, Oxford: Oxford University Press, 119-146

Budzinski, O.r & Gaenssle, S. (2018), The Economics of Social Media Stars: An Empirical Investigation of Stardom, Popularity, and Success on YouTube, Ilmenau Economics Discussion Papers, No. 112.

Budzinski, O. & Grusevaja, M. (2018), The (Behavioral) Economics of Privacy and Big Data: Fundamental Implications and the German Competition Policy Case against Facebook, Ilmenau Economics Discussion Papers.

Budzinski, O. & Köhler, K. H. (2015), Is Amazon The Next Google?, in: ORDO, 66, 263-288.

Budzinski, O. & Lindstädt-Dreusicke, N. (2018), The New Media Economics of Video-on-Demand Markets: Lessons for Competition Policy, Ilmenau Economics Discussion Papers.

Budzinski, O. & Stöhr, A. (2018), Competition Policy Reform in Europe and Germany - Institutional Change in the Light of Digitization, Ilmenau Economics Discussion Papers.

Budzinski, O. & Ruhmer, I. (2010), Merger Simulation in Competition Policy: A Survey, in: Journal of Competition Law & Economics, 6(2), 277-320.

Budzinski, O. & Wacker, K. (2007), The Prohibition of the Proposed Springer-ProSiebenSat.1-Merger: How Much Economics in German Merger Control?, in: Journal of Competition Law & Economics, 3(2), 281-306.

Burnham, T. A., Frels, J. K. & Mahajan, V. (2003), Consumer Switching Costs: A Typology, Antecedents, and Consequences, in: Journal of the Academy of Marketing Science, 31(2), 109-127.

Caffarra, C., Crawford, G. S. & Weeds, H. (2018), Kabuki Dances or Rube Goldberg Machines? Vertical Analyses of Media Mergers, in: The Antitrust Chronicle, 2/2018, 7-14.

Caillaud, B. & Jullien, B. (2003), Chicken and Egg: Competition among Intermediation Service Providers, in: Rand Journal of Economics, 34, 309-328.

Carlton, D. M. & Perloff, J. M. (2000), Modern Industrial Organization, Reading etc.

Coase, R. H. (1937), The Nature of the Firm, in: Economica, 4(16), 386-405.

Cournot, A.-A. (1838), Recherches sur les principes mathematiques de la theorie des richesses, Paris.

Cusumano, M. A. (2015), Technology Strategy and Management: How Traditional Firms Must Compete in the Sharing Economy, in: Communications of the ACM, 58(1), 32-34.

Darby, M. R. & Karni, E. (1973), Free Competition and the Amount of Fraud, in: Journal of Law and Economics, 16, 67-88.

Demange, G. & Gale, D. (1985), The Strategy Structure of Two-Sided Matching Markets, in: Econometrica, 53, 873-888.

Demary, V. (2015), Competition in the Sharing Economy, Institut der deutschen Wirtschaft, IW Policy Paper No. 19/2015, Köln.

Deutscher, E. (2017), The Role of Personal Data and Privacy in Merger Analysis – A Critical Reassessment of the EU Commission's Facebook/WhatsApp Decision, Firenze: European University Institute.

Dittmann, H. & Kuchinke, B. A. (2017), Sharing Economy and Regulation, in: Journal of Business Management and Economics, 5(11), 5-12.

DuPuis, N. & Rainwater, B. (2015), Shifting Perception of Collaborative Consumption: A National League of Cities Survey on the Sharing Economy, Washington.

European Commission (2017), CASE AT.39740 - Google Search (Shopping), C(2017) 4444 final, Brussels.

European Commission (2018), Commission Takes further Steps in Investigations Alleging Google's Comparison Shopping and Advertising-related Practices Breach EU Rules, press release IP/16/2532, Brussels.

Evans, D. S. & Schmalensee, R. (2007), The Industrial Organization of Markets with Two-sided Platforms, in: Competition Policy International, 3(1), 151-179.

Evans, D. S. & Schmalensee, R. (2015), The Antitrust Analysis of Multisided Platform Businesses, in: R. D. Blair & D. D. Sokol (eds.), The Oxford Handbook of International Antitrust Economics, Oxford, 404-447.

Falkinger, J. (2008), Limited Attention as a Scarce Resource in Information-Rich Economies, in: The Economic Journal, 118, 1596-1620.

Farrell, J. & Saloner, G. (1985), Standardization, Compatibility, and Innovation, in: Rand Journal of Economics, 16, 70-83.

Fisher, F. M. & Rubinfeld, D. L. (2001), U.S. v. Microsoft: An Economic Analysis, in: The Antitrust Bulletin, 46(1), 1-69.

Fraiberger, S. & Sundararajan, A. (2015), Peer-to-Peer Rental Markets in the Sharing Economy, NYU Stern School of Business Research Paper, New York.

Gilbert, R. J. & Katz, M. (2001), An Economist's Guide to U.S. v. Microsoft, in: Journal of Economic Perspectives, 15(2), 25-44.

Gross, R. & Acquisti, A. (2005), Information Revelation and Privacy in Online Social Networks: The Facebook Case, ACM Workshop on Privacy in the Electronic Society (WPES).

Grossklags, J. & Acquisti, A. (2007), When 25 Cents is too much: An Experiment on Willingness-To-Sell and Willingness-To-Protect Personal Information. http://people.ischool.berkeley.edu/~jensg/research/paper/Grossklags_Acquisti-WEIS07.pdf.

Hamari, J., Sjöklint, M. & Ukkonen, A. (2015), The Sharing Economy: Why people Participate in Collaborative Consumption, in: Journal of the Association for Information Science and Technology, 6(8), 1-13.

Haucap, J. & Heimeshoff, U. (2014), Google, Facebook, Amazon, eBay: Is the Internet Driving Competition or Market Monopolization?, in: International Economics and Economic Policy, 11(1), 49-61.

Haucap, J. & Stühmeier, T. (2016), Competition and Antitrust in Internet Markets, in: Bauer, J. & Latzer, M. (eds.), Handbook on the Economics of the Internet, Edward Elgar: Cheltenham, 183-210.

Hayek, F. A. von (1945), The Use of Knowledge in Society, in: American Economic Review, 35(4), 519-530.

Hayek, F. A. von (1968), Competition as a Discovery Procedure, in: von Hayek, F. A. (1978, ed.), New Studies in Philosophy, Politics, Economics and the History of Ideas, Chicago, Chicago University Press, 179-190.

Heidhues, P. & Köszegi, B. (2017), Naivete-Based Discrimination, in: The Quarterly Journal of Economics, 132(2), 1019-1054.

Heidhues, P., Köszegi, B. & Murooka, T. (2016), Inferior Products and Profitable Deception, in: The Review of Economic Studies, 84(1), 323-356.

Hermalin, B. E. & Katz, M. L. (2006), Privacy, Property Rights and Efficiency: The Economics of Privacy as Secrecy, in: Quantitative Marketing and Economics, 4(3), 209-239.

Hirshleifer, J. (1971), The Private and Social Value of Information and the Reward to Inventive Activity, in: The American Economic Review, 61(4), 561-574.

Hirshleifer, J. (1973), Where are we in the Theory of Information?, in: American Economic Review, 63(2), 31-39.

Hirshleifer, J. (1980), Privacy: Its Origin, Function, and Future, in: Journal of Legal Studies, 9(4), 649-664.

Hoffmann, F., Inderst, R. & Ottaviani, M. (2016), Persuasion through Selective Disclosure: Implications for Marketing, Campaigning, and Privacy Regulation, discussion paper.

Horney, M. J. (2015), Eight Takeaways From the FTC's Sharing Economy Workshop, in: Perspectives from FSF Scholars, 10(22), http://freestatefoundation.org/images/Eight_Takeaways_from_the_FTC_s_Sharing_Economy_Workshop_070215.pdf.

Hui, K.-L. & Png, I. P. L. (2006), The Economics of Privacy, in: Hendershott, T. (ed.), Economics and Information Systems Vol. 1, Amsterdam: Elsevier, 1-23.

Katz, M. L. & Shapiro, C. (1985), Network Externalities, Competition, and Compatibility, in: American Economic Review, 75, 424-440.

Kerber, W. (2016), Digital Markets, Data, and Privacy: Competition Law, Consumer Law and Data Protection, in: Journal of Intellectual Property Law & Practice, 11(11), 856-866.

Kerber, W. & Schweitzer, H. (2017), Interoperability in the Digital Economy, in: Journal of Intellectual Property, Information Technology and Electronic Commerce Law, 8(1), 39-58.

Koopman, Chr., Mitchell, M. & Thierer, A. (2014), The Sharing Economy and Consumer Protection Regulation: The Case for Policy Change, Mercatus Research, Arlington, http://mercatus.org/sites/default/files/Koopman-Sharing-Economy.pdf.

Koopman, Chr., Mitchell, M. & Thierer, A. (2015), The Sharing Economy: Issues Facing Platforms, Participants, and Regulators, Sharing Economy Workshop, Project No. P17-1200, Fairfax.

Koutsoyiannis, A. (1980), Modern Microeconomics, 2nd ed., London, Basingstoke.

Kuchinke, B. A., Schubert, J. (2006), Der Beschluss des Bundeskartellamtes in Sachen Springer - ProSiebenSat.1 - Eine Einordnung und Bewertung -, in: Wirtschaft und Wettbewerb, 56(5), 477-485.

Marshall, A. (1920), Principles of Economics, 8th ed., London.

Motta, M. (2004), Competition Policy: Theory and Practice, Cambridge: Cambridge University Press.

Obar, J. & Oeldorf-Hirsch, A. (2016), The Biggest Lie on the Internet: Ignoring the Privacy Policies and Terms of Service Policies of Social Networking Services, Working Paper, http://ssrn.com/abstract=2757465.

Perloff, J. M. (2001), Microeconomics, 2nd ed., Boston etc.

Pindyck, R. S. & Rubinfeld, D. L. (2010), Microeconomics, 8th ed., Pearson.

Posner, R. A. (1981), The Economics of Privacy, in: The American Economic Review, 71(2), 405-409.

Rauch, D. E. & Schleicher, D. (2015), Like Uber, but for Local Governmental Policy: The Future of Local Regulation on the "Sharing Economy", George Mason University Law and Economic Research Paper Series, Research Paper No. 15-01, Fairfax.

Rochet, J.-C. & Tirole, J. (2003), Platform Competition in Two-Sided Markets, in: Journal of the European Economic Association, 1(4), 990-1029.

Rochet, J.-C. & Tirole, J. (2006), Two-Sided Markets: A Progress Report, in: Rand Journal of Economics, 37(3), 645-667.

Rochet, J.-Ch. & Tirole, J. (2002), Cooperation among Competitors: The Economics of Payment Card Associations, in: Rand Journal of Economics, 33, 549-570.

Salop, S. C. (2018), Invigorating Vertical Merger Enforcement, in: The Yale Law Journal, 127, 1962-1994.

Scherer, F. M. & Ross, D. (1990), Industrial Market Structure and Economic Performance, 3rd ed., Boston etc.

Schor, J. (2014), Debating the Sharing Economy, Essay, Great Transition Initiative, http://www.greattransition.org/images/GTI_publications/Schor_Debating_the_Sharing_Economy.pdf.

Schwalbe, U. (2018), Algorithms, Machine Lerning, and Collusion, Discussion Paper Universität Hohenheim, https://www.uni-hohenheim.de/organisation/publikation/algorithmus-machine-learning-and-collusion.

Shy, O. (1995), Industrial Organization. Theory and Applications, London.

Skift Report (2013), What the Sharing Economy Means to the Future of Travel, http://skift.com/wp-content/uploads/2014/07/skift-what-the-sharing-economy-means-to-the-future-of-travel.pdf.

Smith, A. (1776), An Inquiry into the Nature and Causes of the Wealth of Nations, Oxford.

Stigler, G. J. (1980), An Introduction to Privacy in Economics and Politics, in: The Journal of Legal Studies, 9(4), 623-644.

Taylor, C. R. (2004), Consumer Privacy and the Market for Customer Information, in: RAND Journal of Economics, 35(4), 631-651.

Tirole, J. (1993), The Theory of Industrial Organisation, 6th ed., Cambridge.

Tucker, C. E. (2012), The Economics of Advertising and Pricing, in: International Journal of Industrial Organization, 30(3), 326-329.

Varian, H. F. (1997), Economic Aspects of Personal Privacy, in: W.M. Daley & L. Irving (Hrsg.), Privacy and Self-Regulation in the Information Age, Washington, D.C.: U.S. Dept. of Commerce.

Vezzoso, S. (2018), Android and Antitrust, in: O. Budzinski & J. Haucap (eds.), Recht und Ökonomik, Baden-Baden: Nomos: 117-144 (forthcoming).

Waldman, D. E. & Jensen, E. J. (2014), Industrial Organisation. Theory and Practice, 4th ed., Reading etc.

Williamson, O. E. (1985), The Economic Institutions of Capitalism, New York, London.

Zobrist, L. & Gramp, M. (2015), The Sharing Economy: Share and Make Money: How Does Switzerland Compare?, Zürich, http://www2.deloitte.com/content/dam/Deloitte/ch/Documents/consumer-business/ch-cb-shared-economy-share-and -make-money.pdf.